Labour Taxation and Its Impact on Employment Growth

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The paper aims to assess the characteristics of labour taxation for five different groups of workers and labour market performance (in terms of employment and unemployment rate) in the EU and to examine whether tax wedge affects employment growth in the EU. The descriptive empirical estimates show that the level of labour taxation varies greatly across EU Member States, by which the tax wedge tends to be higher among New Member States (excluding Cyprus and Malta). Furthermore, the panel regression analyses confirm statistically significant negative relationship between tax wedge and employment growth in the EU as a whole. Therefore, the empirical analysis suggests that the EU-27 should continue with the trend of reducing tax wedge, as this would have favourable effects on labour market performance, especially among New Member States.

Key Words: labour taxation, employment growth, labour market, economic policy, European Union
JEL *Classification:* J30, J38

Introduction

The impact of labour taxation on labour market outcomes has been a subject of numerous discussions in recent years. Namely, by creating a wedge between total labour costs to the employer and the corresponding net take-home pay of the employee, labour taxes in not perfectly flexible labour markets reduce demand for labour (if demand for labour is not perfectly inelastic) and employment and, therefore, increase unemployment (Vodopivec 2004) and intensify exit from the labour force. The existing literature suggests that labour taxation negatively affects labour market performance, yet the extent of its negative impact appears to be affected by the institutional features of the individual labour markets (for

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an overview of studies see, for example, Nickell (2003), de Haan, Sturm and, Volkerink (2003) and OECD (2006)).

In recent years, most of the OECD countries and the EU Member States started to reduce tax wedge on labour in order to alleviate unemployment problems, stimulate job creation, and improve general economic framework (OECD 2006; European Commission 2005). Therefore, the main objective of this paper is to assess the characteristics of labour taxation and labour market outcomes (in terms of employment and unemployment rate) in the EU Member States, to examine differences in labour taxation between EU-15 and New Member States (NMS) and, most importantly, to analyse whether tax wedge affects employment growth in the EU.

In order to explain the characteristics of taxes levied on labour and indicators of labour market performance, we apply basic descriptive statistics. Further, we use cross plots and bivariate correlation analysis to examine the relationship between employment growth and labour taxation. To study the impact of tax wedge on employment growth in detail, we employ panel regression analysis on the sample of 27 EU Member States over the period 1999–2009, by which we expect a negative association. As the analysis of labour tax wedge would be performed for five different groups of workers and would include the latest available data (for the period 1999–2010), the study presents an important value-added in the field.

The rest of the paper is structured as follows. The second section gives a brief overview of previous empirical studies on the impact of tax wedge on labour market outcomes, followed by the presentation of data and methodology in the third section. The fourth section presents the descriptive statistics and dynamics of labour taxation and the results on the impact of tax wedge on employment growth in the EU. The fifth section concludes and gives relevant policy recommendations.

Literature Review

Tax wedge denotes the gap between the cost of labour and the purchasing power of wages (Cahuc and Zylberberg 2004, 753). In a classical competitive labour market approach, the increase of tax wedge can be presented by a downward shift in the labour demand curve. The more elastic is the labour supply curve (and/or demand curve), the higher is the negative effect of tax wedge on employment (Carey 2003, 39–40). Several theoretical and empirical studies try to explain the relationship between labour tax-

ation and labour market outcomes, taking into consideration different institutional features of the individual labour markets (i. e. regulations concerning employment protection, unemployment benefits, minimum wages, skill levels, rigidity of wages and structure of wage bargaining and other labour market policies and institutions). In the continuation of this section, we briefly present some of the most influential empirical studies performed on the macro-level.[1] An overview of these studies is available in de Haan, Sturm and Volkerink (2003), Nickell (2003) and OECD (2006).

In one of the most cited studies, Nickell and Layard (1999) studied the panel of 20 OECD countries between 1983–1994 and showed that a decrease in average tax wedge (including payroll, income and consumption taxes) for 5 percentage points would reduce the unemployment rate by 13%. Likewise in one of the following studies, Nickell (2003) reported that an increase in tax wedge by 10 percentage point would result in the reduction of labour input of the working age population by somewhere between 1 and 3%. Similarly, based on the panel of 21 OECD countries during 1983 and 2003, Bassanini and Duval (2006) confirmed that high tax wedge and generous unemployment benefits increase aggregate unemployment and lower employment prospect. Their obtained empirical results have shown that a 10 percentage points reduction of the tax wedge in an average OECD country would reduce equilibrium unemployment by 2.8 percentage points and increase the employment rate by a larger 3.7 percentage points (due to the positive impact on participation). The detrimental effect of labour taxation on unemployment in OECD countries was confirmed also by Belot and van Ours (2004). Using the panel of 18 OECD countries during the 1960–1994 period authors found that a 10 percentage point higher tax rate is related to a 1.2 percentage point higher unemployment rate.

Several important analyses on the impact of labour taxation on labour market performance have also been performed in the EU countries. For example, Daveri and Tabellini (2000) argued that the slowdown in the economic growth and an increase in unemployment in European countries over the 1965–1991 period were associated with higher labour taxes in combination with institutional characteristics of the labour market. Namely, the correlation was stronger in highly unionized countries of the Continental Europe and much less so in the Scandinavian countries with highly centralized trade unions. The importance of the collective bargaining arrangement was also confirmed by the study of the Euro-

pean Commission (2004), which found that the negative effect of tax wedge on employment is higher in the EU countries with intermediate levels of bargaining co-ordination.[2]

With the enlargement of the EU, a number of authors start to focus their research on the impact of labour taxation on the labour market performance of the NMS. Góra et al. (2006) confirmed a negative effect of tax wedge on employment growth in eight NMS and provided evidence that tax wedge more strongly affects employment rates among low-skilled workers, but high-skilled are rather immune from this effect. Kosi and Bojnec (2006) examined the effect of tax wedge on employment growth in the EU-25 over the period from 1997 to 2004. They established that the impact of labour taxation on employment growth tends to be significantly larger in the eight EU transition countries (NMS) than in the EU non-transition countries. In similar vein, Cazes (2002) found that payroll taxes in transition countries are positively correlated with unemployment rates, especially with long-term and youth unemployment rates. Furthermore, Võrk et al. (2007) showed, using panel regression analysis of eight NMS between 1996 and 2004, that higher tax wedge has a significant negative impact on labour force participation and employment rate (especially for elderly). The results showed that reduction of the tax wedge by 1 percentage point increases employment rate by about 0.2–0.7 percentage points. A detrimental effect of high tax wedges and/or inappropriate benefits systems on the generation of desirable labour market outcomes (employment, unemployment and inactivity) was confirmed also on the sample of ten Central and Eastern EU Member States (CEE)[3] by Behar (2009). A brief review of the literature suggests that tax wedge has been one of the significant reasons for unfavourable labour market performance among countries. Nevertheless, even the estimates of the negative impact of tax wedge on labour market outcomes may be relatively strong, they are subjected to criticism due to robustness of data and empirical model (Blanchard 2006).

Methodology and Data

The analysis of labour taxation is based on the average tax wedge indicator calculated according to the OECD methodology (see OECD 2008). The tax wedge is expressed as the ratio of total labour taxes to total labour costs as paid by an employer:

$$ATW = \frac{PIT + SSC_e + SSC_f + PT - CB}{w + PIT + SSC_e + SSC_f + PT}, \quad (1)$$

where *ATW* stands for average tax wedge, *PIT* is personal income tax, SSC_e social security contributions paid by employees, SSC_f social security contributions paid by firms/employer, *PT* payroll tax paid by employers, *CB* cash benefits and *w* net wage. In the analysis we observe tax wedge for five different groups of workers, i. e. single worker without children at three different wage levels (67%, 100% and 167% of average wage), single worker with two children receiving 67% of average earnings and two-earners family (one receiving 67% and the other 100% of average earnings) with two children. Workers are employed in industry sectors C–K.[4]

The methodological scope of this paper is twofold. Firstly, we examine the level of labour taxation for all of the above mentioned family types, employment rate, and unemployment rate in the EU Member States by using descriptive statistics. Moreover, we present differences between EU-15 and NMS (statistical significance of differences is tested by the Mann-Whitney U test).[5] The analysis is performed on the latest available data for 2009 and 2010.

In the second part of our empirical analysis, we firstly examine whether tax wedge can explain variations in employment growth among the EU countries by applying two-variable cross-country scatter diagrams and bivariate correlation analysis. We continue our empirical analysis with an in-depth study of the impact of tax wedge on employment growth. Following the macroeconomic empirical studies on this issue (see for example Nickell and Layard 1999; Daveri and Tabellini 2000; Belot and van Ours 2004; Võrk et al. 2007; Žižmond and Novak 2006), we employ a panel regression analysis, performed on the sample of 27 EU Member States over the 1999–2009 period. The panel regression analysis includes Driscoll-Kraay standard errors to control for heteroskedacity, autocorrelation and cross-sectional dependence.[6] We formed a regression function (2) with the following specifications:

$$EG_{i,t} = \alpha + \beta_1 \cdot \ln TW_{i,t} + \beta_2 \cdot D_{i,t} + \beta_3 \cdot DTW_{i,t} + \Pi \cdot \begin{bmatrix} \ln GDPpc_{i,t} \\ \ln IR_{i,t} \\ \ln LP_{i,t} \end{bmatrix} + \varepsilon_{i,t}, \quad (2)$$

where *EG* denotes employment growth in country *i* at time *t*, *TW* stands for tax wedge, *GDPpc* for gross domestic product (GDP) per capita, *IR* for inflation rate and *LP* for labour productivity. Parameter ε stands for stochastic disturbances. Moreover, we also introduce dummy variable *D* in the interactive and multiplicative form *DTW* (*D* multiplied by *TW*)

in order to control for differences between EU-15 (dummy variable takes the value 0) and NMS (dummy variable takes the value 1). We perform five separate regression analyses, i. e. for each of the studied family types and wage levels (see above).

Data on employment growth were collected on the basis of Labour Force Surveys and present the change in percentage from one year to another of the total number of employed persons in the country (see http://epp.eurostat.ec.europa.eu). The main explanatory variable is tax wedge, other explanatory variables represent control variables. Therefore, as a measure of control for macroeconomic effects that may influence labour market developments, we include GDP per capita (expressed in Purchasing Power Standards – PPS) and inflation rate (in order to take into consideration effects in monetary or fiscal policy). Labour productivity is measured as GDP in PPS per hour worked.

The panel data on labour taxation were obtained from OECD and Eurostat databases (http://stats.oecd.org/index.aspx; http://epp.eurostat.ec.europa.eu). Data for control explanatory variables (except for labour productivity) were obtained from Eurostat and official reports of the European Commission (2009a; 2009b; 2010). The data on labour productivity were obtained from The Conference Board statistical database (http://www.conference-board.org/data/economydatabase).

Although the period we analyse is determined by the availability of the data, going further back in the past would not bring clear results in most of the NMS, as their economies were under great influence of the transitional economic and political processes (see Vodopivec, Wörgötter, and Raju 2005; Võrk et al. 2007; Jerman, Kavčič, and Kavčič 2010). Moreover, the analysis focuses on the size of the tax wedge-employment growth relationship on the labour demand side, while it does not study in detail the effects of factors at the labour supply side and other labour market institutions (for example minimum wage, skills, employment protection legislation, etc.).

Empirical Analysis

OVERVIEW OF LABOUR TAXATION AND LABOUR MARKET PERFORMANCE IN THE EUROPEAN UNION

There are large differences in the level of labour taxation among EU Member States. As can be seen from table 1, which gives an overview of the latest available data on tax wedge for three family types at three dif-

TABLE 1 Tax wedge according to the family type and level of average earnings, employment rate and unemployment rate (in %) in the EU, 2010

Country	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Austria	43.3	47.9	50.4	26.4	40.0	71.7	4.5
Belgium	49.5	55.4	60.6	34.8	47.8	62.0	8.4
Bulgaria[a]	33.9	33.8	33.8	19.4	28.0	59.7	10.3
Cyprus[a]	:	:	:	:	:	69.7	6.4
Czech Republic	38.9	42.2	44.7	15.7	34.4	65.0	7.4
Denmark	36.7	38.3	44.5	11.0	33.7	73.4	7.6
Estonia	38.6	40.0	41.2	23.4	35.5	61.0	17.3
Finland	36.3	42.0	47.9	24.7	36.5	68.1	8.5
France	45.5	49.3	53.2	37.2	44.3	64.0	9.3
Germany	44.9	49.1	51.5	29.7	41.4	71.1	7.2
Greece	34.4	36.6	41.9	34.4	35.7	59.6	12.7
Hungary	43.6	46.4	52.7	26.6	39.2	55.4	11.2
Ireland	23.4	29.3	39.9	−9.5	21.1	60.0	13.7

Continued on the next page

ferent levels of average earnings, Belgium, France and Germany exhibit the highest level of labour taxation, whereas Ireland and Malta stand out with the lowest tax wedge.

All EU Member States, with exception of Bulgaria, record a progressive tax wedge (commonly due to progressive income tax rates), implying that the level of labour taxation increases with an increase of wage levels. Namely, average value of labour taxation in the EU-27 in 2009[7] amounted 37.0% for single worker with 67% of average earnings, whereas 43.8% for worker with 167% of average earnings. As can be seen from table 2, the progressivity of tax wedge is more intense among old Member States. Moreover, labour is less taxed for families (for a single worker with two children and 67% of average earnings on average amounted 20.5%, whereas for two-earner family 34.8%), mostly due to their entitlement to cash benefits.

Labour taxation in the EU is relatively high in international comparative framework, especially when compared to OECD countries that are not members of the EU. For example, average tax wedge for single worker with 67% and 167% average earnings amounted 24.0% and 31.8%, respectively, what for even 13.0 and 11.2 percentage points, respectively, ex-

TABLE 1 *Continued from the previous page*

Country	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Italy	43.6	46.9	52.1	27.2	42.1	56.9	8.5
Latvia[a]	41.5	42.2	42.7	28.2	35.0	59.3	19.0
Lithuania[a]	38.9	40.7	42.1	8.0	36.6	57.8	18.0
Luxembourg	27.5	34.0	41.4	0.4	20.9	65.2	4.4
Malta[a]	17.7	22.3	26.4	1.1	18.8	56.0	7.0
The Netherlands	34.0	39.2	42.5	14.4	33.7	74.7	4.5
Poland	33.4	34.3	35.0	28.4	30.8	59.3	9.7
Portugal	32.8	37.7	43.8	21.6	33.1	65.6	11.4
Romania[a]	43.1	44.4	45.5	30.7	41.0	58.8	7.6
Slovakia	34.5	37.8	40.2	21.4	31.2	58.8	14.4
Slovenia	38.5	42.4	47.3	11.8	33.8	66.2	7.4
Spain	36.4	39.6	42.5	28.8	36.6	58.6	20.2
Sweden	40.6	42.7	50.8	32.2	38.5	72.7	8.6
United Kingdom	29.6	32.7	37.5	10.7	28.8	69.5	7.9

NOTES Column headings are as follows: (1) single person, 0 children, 67% of average earnings, (2) single person, 0 children, 100% of average earnings, (3) single person, 0 children, 167% of average earnings, (4) single person, 2 children, 67% of average earnings, (5) 2-earner family, 2 children, 67% and 100% of average earnings, (6) employment rate (15–64 years), (7) unemployment rate (15–64 years). [a] Data refer to the year 2009. Adapted from Eurostat (http://epp.eurostat.ec.europa.eu) and OECD (http://stats.oecd.org/index.aspx).

ceeds the average of the EU-27 (differences are statistically significant at 5% level of significance). These high differences among others reflect less strict employment regulation among non-EU OECD countries.

Comparing old and new EU member countries, labour taxation is on average lower in NMS for all family types and at all levels of average earnings. However, the difference is not statistically significant at 5% level of significance, probably due to high variability in tax wedges in NMS (see table 2). As the low averages in NMS could be reasoned with the level of tax wedge in Cyprus and Malta,[8] two facts should be taken into consideration in further analysis. Firstly, a more appropriate measure of comparison between EU-15 and NMS is median tax wedge (see table 2) and, secondly, Cyprus and Malta should be studied separately from other (Central and Eastern) NMS, which share similar characteristics also due to the transitional development in the 1990s. This is in line with studies

TABLE 2 Descriptive statistics on labour taxation, employment and unemployment rate by groups of countries, 2009

Country	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EU-27[a]							
Mean	37.0	40.5	44.7	20.5	34.8	64.5	9.0
St. deviation	7.4	7.5	7.6	11.8	7.5	5.9	3.6
Median	37.9	40.1	43.8	23.8	34.9	63.5	8.0
EU-15[b]							
Mean	37.2	41.5	47.1	21.1	35.7	66.9	8.4
St. deviation	7.6	7.4	6.4	13.5	8.0	5.9	3.4
Median	36.9	39.5	48.2	25.4	37.0	66.3	8.0
NMS[a,b]							
Mean	36.8	39.2	41.4	19.7	33.5	61.5	9.6
St. deviation	7.5	7.7	8.2	9.7	6.8	4.5	3.9
Median	38.7	40.7	42.1	21.2	34.2	60.6	7.8
CEE[b]							
Mean	38.7	40.9	43.0	21.6	35.0	61.4	10.3
St. deviation	4.2	5.5	6.9	7.9	5.0	3.5	3.9
Median	38.8	41.4	42.4	21.9	34.5	60.6	9.2
Estimates of the Mann-Whitney U test							
EU-15 vs. NMS	80.0	72.5	47.0**	68.5	61.5	42.5*	81.0
EU-15 vs. CEE	65.0	72.5	47.0	66.5	61.5	33.0*	58.0

NOTES Column headings are as follows: (1) single person, 0 children, 67% of average earnings, (2) single person, 0 children, 100% of average earnings, (3) single person, 0 children, 167% of average earnings, (4) single person, 2 children, 67% of average earnings, (5) 2-earner family, 2 children, 67% and 100% of average earnings, (6) employment rate (15–64 years), (7) unemployment rate (15–64 years). [a] Cyprus is due to the lack of data excluded from the calculations of descriptive statistics for labour taxation. [b] EU-15 refers to the EU Member States that become members of the EU prior to 2004. NMS (12) refers to all EU Member States that joined EU after 2004. CEE-10 includes 10 Central and Eastern EU Member States that joined EU after 2004 (i. e. NMS without Cyprus and Malta). Significance level: * 5%, ** 10%. Adapted from Eurostat (http://epp.eurostat.ec.europa.eu) and OECD (http://stats.oecd.org/index.aspx).

performed by Ederveen and Thissen (2007), Võrk et al. (2006) and Behar (2009).

Taking into the account the above obtained conclusions, the descriptive statistical analysis shows that with the regard to the median measure CEE countries in 2009 record higher tax wedge for single workers with

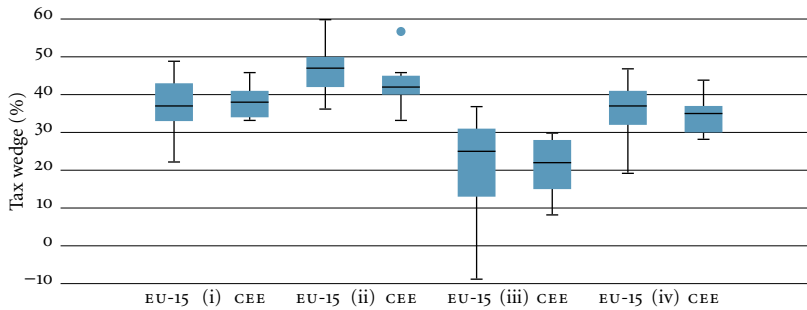

FIGURE 1 Comparison of labour taxation in EU-15 and CEE-10, 2009

NOTES (i) and (ii) refer to single worker without children with 67% and 167% of average earnings, respectively, (iii) refers to single low-paid worker with two children and (iv) refers to two-earner family (one earning 100% and the other 67% of average earnings) with two children. The horizontal line inside the shaded box is the median value of the group; the bottom edge of the shaded box presents 25th percentile and the upper edge 75th percentile; the horizontal lines outside the box indicate the largest and the smallest value in the sample; the dot indicates the largest value in the sample of CEE-10 (56.7 per cent). Similar analysis on tax wedge for year 2005 was performed also by Behar (2009). Based on data from Eurostat (http://epp.eurostat.ec.europa.eu) and OECD (http://stats.oecd.org/index.aspx).

TABLE 3 Dynamics of labour taxation in EU-15 and CEE, 1999–2010, median

Group	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EU-27	37.9	38.9	38.4	38.3	37.9	37.9	37.3	37.2	37.1	36.5
High tax wedge group	38.7	40.3	39.9	39.5	38.4	38.3	37.9	38.0	38.2	38.0
Low tax wedge group	37.1	37.6	37.0	37.1	37.4	37.6	36.8	36.4	36.1	35.0
Median EU-27	41.1	41.4	41.3	40.9	40.9	40.8	41.4	40.1	40.6	38.9

67% and 100% of average earnings, whereas the labour taxation is lower for high-paid single workers (even for 5.8 percentage points) and for both family types with children (see table 2). Differences between groups of countries are not statistically significant at 5% level of significance. Nevertheless, as it can be seen from figure 1, the height of the boxes and the distances between minimum and maximum values of tax wedge indicate higher labour taxation heterogeneity within EU-15.

Table 3 presents the dynamics of labour taxation at three different wage levels in EU-15 and CEE countries over the 1999–2010 period. The median labour taxation was, in general, slowly declining after the 2000 in both groups, by which the decline was the most pronounced in the last two years (except for high paid workers). The dynamics was more intense

in labour taxation of single average worker in EU-15, as the median tax wedge value increased for 3 percentage points in 2006 comparing to the year before and then again decreased in 2009 for 4 percentage points comparing to the year before (the dynamics mostly reflects changes in labour taxation in the Netherlands and Greece). Comparing EU-15 and CEE, the median labour taxation is higher in CEE countries for low-paid worker, whereas for high-paid workers the tax wedge is lower (yet, differences in labour taxation were not statistically significant over the studied period). On average, the decrease in labour taxation was greater among CEE countries at all family types and at all levels of earnings. Namely, over the 1999–2009 period the tax wedge for single worker at different wage levels varied between 3.1 and 3.7 percentage points in CEE, whereas in EU-15 from 0.4 to 1.3 percentage points.

Regarding the employment rate, the EU-15 countries recorded statistically significant (at 5% level of significance) higher tax wedge over the 1999–2010 period. The employment rate was steadily increasing in both groups of countries until 2008, followed by the decrease of employment in the last two years, reflecting the economic situation influenced by crisis. Therefore, the median employment rate decreased to 65.6% in 2010 in EU-15 and to 59.3% in CEE. On the other hand, the unemployment rate increased: the median unemployment rate in EU-15 in 2010 amounted 8.5%, while in CEE 10.8%, yet the difference is not statistically significant (see table 2).

As the dynamics of labour taxation and employment rate is quite similar, we examined whether there was any correlation between labour taxation and employment and unemployment rate over the 1999–2008 period. We find no evidence on the association between tax wedge and employment rate, as the bivariate correlation coefficients were statistically insignificant at 5% level of significance for all studied groups of workers. The correlation coefficients were statistically insignificant at 5% level of significance also between tax wedge and unemployment rate for single workers with 67%, 100% or 167% workers. However, the results show the existence of a weak positive association between labour taxation and unemployment rate for single low-paid worker with two children (the correlation coefficient amounted 0.257 at 5% level of significance) and for two-earner family (the correlation coefficient amounted 0.129 at 5% level of significance).[9] Therefore, a further analysis on the relationship between labour taxation and labour market performance is needed.

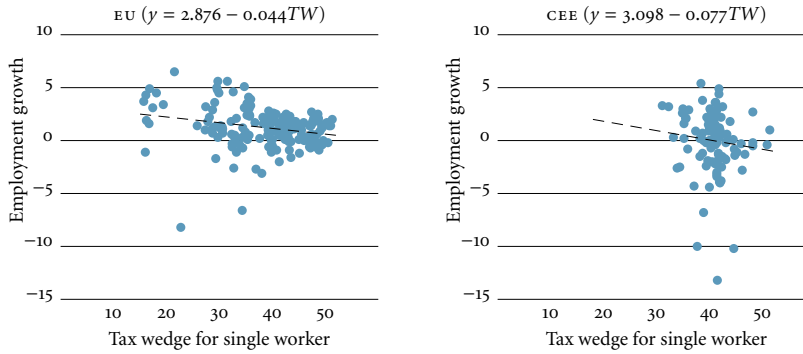

FIGURE 2 Relation between tax wedge and employment growth in EU-15 and CEE

NOTES * with 67% of average wage; data refer to the period 1999–2009. Based on data from Eurostat (http://epp.eurostat.ec.europa.eu) and OECD (http://stats.oecd.org/index.aspx).

RELATIONSHIP BETWEEN LABOUR TAXATION AND EMPLOYMENT GROWTH

In this section, we focus on the relationship between tax wedge and employment growth. To study the association, we firstly use simple two-variable cross-country scatter diagrams to plot employment growth and tax wedge. As can be seen from figure 2, there is a weak negative correlation between tax wedge for low-paid workers and employment growth among EU and CEE Member States in the 1999–2009 period. The presence of the negative correlation between employment growth and labour taxation was observed also in scatter plots of all other studied family types. The existence of negative correlation was confirmed also by bivariate correlation analysis (see table 4). For example, the correlation coefficient between tax wedge for low-paid workers and employment growth in the EU-27 amounted –0.230 (statistically significant at 5% level of significance). However, the size of the negative correlation coefficient estimate between labour taxation for single workers and employment growth is decreasing with the rise of wages. The correlation coefficients in table 4 also show that correlation between labour taxation is higher (and statistically significant at 5% level of significance) among old EU countries. A significant negative correlation was observed for workers with children.

In order to examine the tax wedge-employment growth relation in more detail, we conducted panel data regression analysis for all EU Member States over the period from 1999 to 2009. As can be seen from table 5,

TABLE 4 Correlation coefficient estimates between employment growth and labour taxation

Country	(1)	(2)	(3)	(4)	(5)
EU-27	−0.230*	−0.195*	−0.140*	−0.174*	−0.236*
EU-15	−0.220*	−0.172*	−0.154*	−0.204*	−0.245*
CEE	−0.123	−0.095	−0.067	−0.051	−0.135

NOTES Column headings are as follows: (1) single person, 0 children, 67% of average earnings, (2) single person, 0 children, 100% of average earnings, (3) single person, 0 children, 167% of average earnings, (4) single person, 2 children, 67% of average earnings, (5) 2-earner family, 2 children, 67% and 100% of average earnings. Signif. level: *5%.

TABLE 5 Estimates of the panel regression analysis for the EU-27, 1999–2009

Dependent variable	(1)	(2)	(3)	(4)	(5)
ln*TW*	−1.746*	−1.878*	−2.455*	−0.057	−1.644*
ln*GDPpc*	−0.041	−0.070	−0.114	−0.197*	−0.018
ln*IR*	0.611	0.624	0.646	0.577	0.583
ln*LP*	1.885*	1.926*	2.037*	2.165*	1.670*
D	−0.036	0.021	−0.192	−0.061	0.475
DTW	−0.003	−0.007	−0.005	−0.001	−0.022
Constant	0.520	1.376	4.011	−4.727	0.619
R^2	0.211	0.206	0.206	0.156	0.211

NOTES Column headings are as follows: (1) single person, 0 children, 67% of average earnings, (2) single person, 0 children, 100% of average earnings, (3) single person, 0 children, 167% of average earnings, (4) single person, 2 children, 67% of average earnings, (5) 2-earner family, 2 children, 67% and 100% of average earnings. Signif. level: *5%.

the regression estimates confirm statistically significant negative impact of tax wedge on employment growth in all studied family types with the exception of low-paid workers with two children. The size of the negative impact of labour taxation on employment growth differs between workers according to their level of average earnings, confirming that the elasticities between tax wedge and employment growth are increasing with wage. Namely, an increase in tax wedge for low-paid worker for one percentage point reduces employment growth for 1.7%, *ceteris paribus,* whereas for high-paid workers decrease is higher and amounts 2.5%, *ceteris paribus.* We find no evidence on the difference in the negative impact of labour taxation on employment growth between EU-15 and NMS (the regression estimates for *DTW* are statistically significant). There-

fore, the results imply that lowering labour taxation would improve the employment growth among EU countries.

Although the panel regression coefficients on tax wedge are low and suffer from low R^2 values, findings are, in general, in line with various empirical studies, which also confirmed negative relation between tax wedge and labour market outcomes. For example, Ederveen and Thissen (2007) found a statistically significant positive relationship between unemployment rate and tax wedge on the sample of four CEE countries. Also Góra et al. (2006) showed a strong and significant negative relationship between employment growth and tax wedge in CEE and a strong impact of tax wedge employment rates of low-skilled workers. Behar (2009) as well concluded that high tax wedge and inappropriate benefit system are associated with poor labour market outcomes, but the evidence was weak.

Concluding Remarks and Policy Recommendations

This paper assessed the characteristics of labour taxation and labour market performance in the EU Member States based on the latest available data and examined whether tax wedge affected the employment growth in the EU Member States over the period from 1999 to 2009.

The findings of the paper imply that the reduction in taxes on labour could increase demand on labour and employment as it would motivate the employers to create jobs,[10] especially for low-wage workers, and increase people's willingness to work (OECD 2009). The establishment of the employment-friendly wage is also crucial for increasing productivity and improving general economic framework in the EU (European Commission 2005). Several Member States have already taken measures to reduce tax wedge such as reducing social security contributions for disadvantaged groups, lowering tax threshold for personal income tax, tightening the provision of contributions for self-employment, changing the legislation in the field of minimum wages and social security contributions, increase in nominal wages, etc. (more information on measures across the EU Member States are available in quarterly reports of the European Employment Observatory (http://www.eu-employment-observatory.net) and in Carone et al. (2009)).

Policy recommendation following from our empirical analysis is clear: the EU should continue with the trend of reducing labour taxation, as this would have favourable effects on employment growth and would consequently lead to higher productivity and improve competitiveness.

However, the reduction in tax wedge is not a sufficient measure to increase employment, as the reasons for high unemployment rate in many EU Member States are very diverse and complex, including high unemployment benefits, wage negation system and powerful labour unions, employment protection legislation, differences in distribution of wages within EU, etc.

To conclude, the findings of this paper are, in general, in line with previous empirical research, as the empirical estimates confirm the detrimental effect of tax wedge on employment growth. The added value of the paper comparing to previous empirical studies stems out of the panel regression analysis performed on five different groups of workers and thereby higher robustness of the results and the inclusion of the latest available data for EU countries. However, one has to remember the limitations of these findings deriving from the availability of good time series information on tax wedge, its composition, and other labour market outcomes; small number of variables used and therefore possible formation of omitted variables problem; and insufficient sources of variation and low value of R^2.

Notes

1 Although we mainly focus on the macroeconometric empirical literature (due to the nature of our methodological approach), there are also several empirical studies based on the micro data (see for example Gruber 1997; Kugler and Kugler 2003; 2009).

2 Likewise, Elmeskov, Martin and Scarpeta (1998) argued that the collective bargaining systems could influence the manner in which tax wedge affects unemployment. Authors showed that the effect of tax wedge is lower in countries with highly decentralised and centralised bargaining arrangements and stronger in countries with intermediate levels of co-ordination.

3 CEE countries are Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

4 According to NACE Rev. 2, sectors C–K were replaced by sectors B–N.

5 The Mann-Whitney U non-parametric test was used due to small number of studied countries.

6 The presence of heteroskedacity, autocorrelation and cross-sectional dependence was confirmed by the likelihood-ratio test, Wooldrige test and Pasaran CD test, respectively.

7 Although the data for 2010 are available, we present descriptive statistics for 2009, as the data are accessible for all EU Member States, except Cyprus.

8 The low levels of tax wedge in Cyprus and Malta might be linked to their historical ties to Britain, as also Ireland and United Kingdom show one of the lowest tax wedges in the EU-15 (European Commission 2009a).

9 As the correlation coefficients are statistically insignificant for most studied cases we do not present them in a separate table, however are available at the authors.

10 Lower tax rate may increase companies' business expectations which may increase the companies' willingness to employ (Stubelj 2010).

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